

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Withdrawn): An information transmission system for transmitting information from a sending apparatus to a receiving apparatus, said information transmission system comprising:

a sending apparatus for modulating an information signal, generating a plurality of signals including an optical signal from said information signal which is modulated, and transmitted said plurality of signals via a plurality of routes; and

a receiving apparatus for receiving said plurality of signals from said sending apparatus, combining said plurality of signals, and outputting said information signal.

Claim 2 (Withdrawn): The information transmission system as claimed in claim 1, wherein said plurality of signals are a plurality of optical signals or signals including a radio signal.

Claim 3 (Withdrawn): An information transmission method used for transmitting information from a sending apparatus to a receiving apparatus, said information transmission method comprising the steps of:

a sending apparatus modulating an information signal, generating a plurality of signals including an optical signal from said information signal which is modulated, and transmitting said plurality of signals; and

a receiving apparatus receiving said plurality of signals from said sending apparatus, combining said plurality of signals, and outputting said information signal.

Claim 4 (Withdrawn): The information transmission method as claimed in claim 3, wherein said plurality of signals are a plurality of optical signals or signals including a radio signal.

Claim 5 (Withdrawn): An optical space transmission system comprising:  
a first optical space transmission apparatus including one or more optical transmitters which send a radio modulation signal converted from an information signal; and  
a second optical space transmission apparatus including one or more optical receivers which combine a plurality of receive signals transmitted by said first optical space transmission apparatus via a plurality of paths.

Claim 6 (Withdrawn): The optical space transmission system as claimed in claim 5, wherein said one or more optical transmitters send said radio modulation signal a plurality of times by shifting sending time, and said plurality of receive signals are transmitted via a plurality of paths with respect to time or space.

Claim 7 (Withdrawn): An optical space transmission system comprising:  
a first optical space transmission apparatus including a radio signal modulation part which converts an information signal to be sent into a radio modulation signal, and an optical transmitter which converts output of said radio signal modulation part into an optical signal;  
and

a second optical space transmission apparatus including a plurality of optical receivers which convert optical signals received from said optical transmitter into electrical signals, and a diversity radio signal processing part which combines outputs of said optical receivers.

Claim 8 (Withdrawn): An optical space transmission system comprising:

a first optical space transmission apparatus including a radio signal modulation part which converts an information signal to be sent into a radio modulation signal, a part which divides output of said radio signal modulation part into a plurality of branches, and a plurality of optical transmitters which converts signals of said branches into optical signals and transmit said optical signals to the air; and

a second optical space transmission apparatus including an optical receiver which receives said optical signals sent from said optical transmitters and converts said optical signals into electrical signals, and a radio signal processing part which equalizes and combines output of said optical receiver.

Claim 9 (Withdrawn): An optical space transmission system comprising:

a first optical space transmission apparatus including a part which divides an information signal to be sent into a plurality of branches, a plurality of radio signal modulation parts which convert signals of said branches into radio modulation signals, and a plurality of optical transmitters which converts outputs of said radio signal modulation parts into optical signals and transmit said optical signals to the air; and

a second optical space transmission apparatus including an optical receiver which receives said optical signals sent from said optical transmitters and converts said optical

signals into electrical signals, and a radio signal processing part which equalizes and combines output of said optical receiver.

Claim 10 (Withdrawn): An optical space transmission system comprising:

a first optical space transmission apparatus including a radio signal modulation part which converts an information signal to be sent into a radio modulation signal, a part which divides output of said radio signal modulation part into a plurality of branches, and a plurality of optical transmitters which converts signals of said branches into optical signals and transmits said optical signals to the air; and

a second optical space transmission apparatus including a plurality of optical receivers which receive said optical signals sent from said optical transmitters and convert said optical signals into electrical signals, and a diversity radio signal processing part which equalizes and combines outputs of said optical receivers.

Claim 11 (Withdrawn): An optical space transmission system comprising:

a first optical space transmission apparatus including a part which divides an information signal to be sent into a plurality of branches, a plurality of radio signal modulation parts which convert signals of said branches into radio modulation signals, and a plurality of optical transmitters which convert outputs of said radio signal modulation parts into optical signals and transmit said optical signals to the air; and

a second optical space transmission apparatus including a plurality of optical receivers which receive said optical signals sent from said optical transmitters and convert said optical signals into electrical signals, and a diversity radio signal processing part which equalizes and combines outputs of said optical receivers.

Claim 12 (Withdrawn): The optical space transmission system as claimed in claim 8, said first optical space transmission apparatus including at least a delay circuit which delays a part of signals of said branches.

Claim 13 (Withdrawn): The optical space transmission system as claimed in claim 9, said first optical space transmission apparatus including at least a delay circuit which delays a part of signals of said branches.

Claim 14 (Withdrawn): An optical space transmission system comprising:  
a first optical space transmission apparatus including a radio signal modulation part which converts an information signal to be sent into a radio modulation signal, a part which divides output of said radio signal modulation part into a plurality of branches, one or more delay circuits which delay a part of signals of said branches, a multiplexer which multiplexes output of said delay circuits and signals of the other branches, and an optical transmitter which converts output of said multiplexer into an optical signal and transmits said optical signal to the air; and

a second optical space transmission apparatus including an optical receiver which receives said optical signal sent from said optical transmitter and converts said optical signal into an electrical signal and a radio signal processing part which equalizes and combines output of said optical receiver.

Claim 15 (Withdrawn): The optical space transmission system as claimed in claim 7, said radio signal modulation part in said first optical space transmission apparatus including a

baseband modulation part, and an orthogonal modulation part which orthogonally modulates output of said baseband modulation part.

Claim 16 (Withdrawn): The optical space transmission system as claimed in claim 15, said radio signal modulation part further including a frequency converter after said orthogonal modulation part, and a local oscillator which generates a reference signal for said frequency converter.

Claim 17 (Withdrawn): The optical space transmission system as claimed in claim 8, said radio signal processing part in said second optical space transmission apparatus comprising:

- an orthogonal detection part which detects baseband radio modulation signals sent from said first optical space transmission apparatus;

- an equalizer which equalizes and combines output of said orthogonal detection part;
- and

- a baseband demodulation part which converts output of said equalizer into an original information signal.

Claim 18 (Withdrawn): The optical space transmission system as claimed in claim 9, said radio signal processing part in said second optical space transmission apparatus comprising:

- an orthogonal detection part which detects baseband radio modulation signals sent from said first optical space transmission apparatus;

an equalizer which equalizes and combines output of said orthogonal detection part;

and

a baseband demodulation part which converts output of said equalizer into an original information signal.

Claim 19 (Withdrawn): The optical space transmission system as claimed in claim 8, said radio signal processing part in said second optical space transmission apparatus comprising:

a frequency converter which converts radio modulation signals of intermediate frequency band or radio frequency band sent from said first optical space transmission apparatus into baseband;

a local oscillator which generates a reference signal for said frequency converter;

an orthogonal detection part which detects baseband radio modulation signals output from said frequency converter;

an equalizer which equalizes and combines output of said orthogonal detection part;

and

a baseband demodulation part which converts output of said equalizer into an original information signal.

Claim 20 (Withdrawn): The optical space transmission system as claimed in claim 9, said radio signal processing part in said second optical space transmission apparatus comprising:

a frequency converter which converts radio modulation signals of intermediate frequency band or radio frequency band sent from said first optical space transmission apparatus into baseband;

a local oscillator which generates a reference signal for said frequency converter;

an orthogonal detection part which detects baseband radio modulation signals output from said frequency converter;

an equalizer which equalizes and combines output of said orthogonal detection part; and

a baseband demodulation part which converts output of said equalizer into an original information signal.

Claim 21 (Withdrawn): The optical space transmission system as claimed in claim 7, said diversity radio signal processing part in said second optical space transmission apparatus comprising:

a plurality of orthogonal detection parts which detect baseband signals received by said optical receivers;

a baseband diversity equalization combining part which combines outputs of said orthogonal detection parts; and

a baseband demodulation part which converts output of said baseband diversity equalization combining part into an original information signal.

Claim 22 (Withdrawn): The optical space transmission system as claimed in claim 7, said diversity radio signal processing part in said second optical space transmission apparatus comprising:



a diversity combining part which combines signals of intermediate frequency band or radio frequency band received by said optical receivers;

a frequency converter for output of said diversity combining parts;

a local oscillator which generates a reference signal for said frequency converter;

an orthogonal detection part which detects baseband radio modulation signals output from said frequency converter;

an equalizer which equalizes and combines output of said orthogonal detection part;

and

a baseband demodulation part which converts output of said equalizer into an original information signal.

Claim 23 (Withdrawn): The optical space transmission system as claimed in claim 7, said diversity radio signal processing part in said second optical space transmission apparatus comprising:

a plurality of frequency converters which perform frequency conversion for signals of intermediate frequency band or radio frequency band received by said optical receivers;

a local oscillator which generates a reference signal for said frequency converters;

a plurality of orthogonal detection parts which detect baseband signals output from said frequency converters;

a baseband diversity equalization combining part which combines outputs of said orthogonal detection parts; and

a baseband demodulation part which converts output of said baseband diversity equalization combining part into an original information signal.

Claim 24 (Withdrawn): The optical space transmission system as claimed in claim 22, said diversity combining part comprising a part which performs maximum ratio combining for a plurality of input signals.

Claim 25 (Withdrawn): The optical space transmission system as claimed in claim 22, said diversity combining part comprising a part which performs selection combining for a plurality of input signals according to receive level.

Claim 26 (Withdrawn): The optical space transmission system as claimed in claim 22, said diversity combining part comprising a part which performs equal gain combining for a plurality of input signals.

Claim 27 (Withdrawn): The optical space transmission system as claimed in claim 21, said baseband diversity equalization combining part comprising:  
transversal equalizers which equalize input baseband signals; and  
a part for performing maximum ratio combining for outputs of said transversal equalizers.

Claim 28 (Withdrawn): The optical space transmission system as claimed in claim 21, said baseband diversity equalization combining part comprising:  
transversal equalizers which equalize input baseband signals; and  
a part for performing selection combining for outputs of said transversal equalizers.

Claim 29 (Withdrawn): The optical space transmission system as claimed in claim 21, said baseband diversity equalization combining part comprising:  
transversal equalizers which equalize input baseband signals; and  
a part for performing equal gain combining for outputs of said transversal equalizers.

Claim 30 (Withdrawn): The optical space transmission system as claimed in claim 21, said baseband diversity equalization combining part comprising an adaptive decision feedback type transversal combining diversity part.

Claim 31 (Withdrawn): The optical space transmission system as claimed in claim 30, wherein said adaptive decision feedback type transversal combining diversity part uses an adaptive algorithm for determining tap coefficients of said transversal equalizers.

Claim 32 (Withdrawn): The optical space transmission system as claimed in claim 31, wherein RLS algorithm is used as said adaptive algorithm.

Claim 33 (Withdrawn): The optical space transmission system as claimed in claim 31, wherein LMS algorithm is used as said adaptive algorithm.

Claim 34 (Withdrawn): An optical space transceiver comprising a first optical space transmission apparatus and a second optical space transmission apparatus;  
said first optical space transmission apparatus including one or more optical transmitters which send an information signal converted into a radio modulation signal; and

said second optical space transmission apparatus including one or more optical receivers which combines a plurality of receive signals sent via a plurality of paths.

Claim 35 (Withdrawn): An optical space transmission method comprising the steps of:

converting an information signal to be sent into a radio modulation signal, and sending said radio modulation signal as an optical signal in a sending station;

receiving optical signals, converting said optical signals into electrical signals, and demodulating said electrical signals by performing equalization and combining or by performing diversity combining in a receiving station.

Claim 36 (Withdrawn): An optical space transmission apparatus having one or more optical transmitters in an optical space transmission system which includes said optical space transmission apparatus having one or more optical transmitters and an optical space transmission apparatus having one or more optical receivers, wherein:

said optical space transmission apparatus having one or more optical transmitters includes one or more radio signal modulation parts which converts an information signal into one or more radio modulation signals.

Claim 37 (Withdrawn): The optical space transmission apparatus as claimed in claim 36, wherein said one or more optical transmitters send said radio modulation signal a plurality of times by shifting sending time.

Claim 38 (Withdrawn): An optical space transmission apparatus having one or more optical receivers in an optical space transmission system which includes an optical space transmission apparatus having one or more optical transmitters and said optical space transmission apparatus having one or more optical receivers, wherein:

said optical space transmission apparatus having one or more optical receivers receives signals transmitted via a plurality of paths by said optical space transmission apparatus having one or more optical transmitters, combines said signals transmitted via a plurality of paths.

Claim 39 (Withdrawn): The optical space transmission apparatus as claimed in claim 38, wherein said one or more optical transmitters send a radio modulation signal a plurality of times by shifting sending time as optical signals, and said one or more optical receivers receive said optical signals transmitted via a plurality of paths with respect to time or space.

Claim 40 (Withdrawn): An information transmission system for transmitting information from a sending apparatus to a receiving apparatus, said information transmission system comprising said sending apparatus and said receiving apparatus;

said sending apparatus comprising:

a radio signal modulation part for modulating an information signal;

a radio signal transmitter for transmitting said information signal which is modulated to said receiving apparatus as a radio signal; and

an optical signal transmitter for transmitting said information signal which is modulated to said receiving apparatus as an optical signal,

said receiving apparatus comprising:

a radio signal receiver for receiving said radio signal transmitted from said sending apparatus and outputting a first signal;

an optical signal receiver for receiving said optical signal transmitted from said sending apparatus and outputting a second signal; and

a signal combining part for combining said first signal and said second signal, and regenerating said information signal.

Claim 41 (Withdrawn): The information transmission system as claimed in claim 40, said sending apparatus further comprising:

a signal dividing part for dividing said information signal into a first signal part and a second signal part;

wherein said radio signal transmitter transmits said first signal part to said receiving apparatus as a radio signal, and said optical signal transmitter transmits said second signal part to said receiving apparatus as an optical signal.

Claim 42 (Currently Amended): An information transmission system for transmitting information from a sending apparatus to a receiving apparatus, said information transmission system comprising said sending apparatus and said receiving apparatus which include a mode selection part for selecting one of a first transmission mode and a second transmission mode,

said sending apparatus comprising:

~~a signal dividing part for dividing an information~~ a demultiplexer configured to segment a data signal into a first data signal ~~part~~ and a second data signal ~~part~~ that are different from each other;

radio signal modulation parts ~~for modulating~~ configured to modulate said first data signal ~~part~~ and said second data signal ~~part~~;

a control part ~~for controlling~~ configured to control said sending apparatus such that said first data signal ~~part~~ is transmitted to said receiving apparatus as a radio signal and said second data signal ~~part~~ is transmitted to said receiving apparatus as an optical signal when said first transmission mode is selected;

said control part controlling said sending apparatus such that said information signal is transmitted to said receiving apparatus via a plurality of routes including a radio transmission route and an optical transmission route when said second transmission mode is selected,

said receiving apparatus comprising:

a part ~~for multiplexing~~ configured to multiplex said first data signal ~~part~~ and said second data signal ~~part~~ when said first transmission mode is selected; and

a part ~~for diversity combining~~ configured to diversity-combine said information signal which is transmitted via said plurality of routes when said second transmission mode is selected.

Claim 43 (Original): The information transmission system as claimed in claim 42, wherein said mode selection part selects said first transmission mode when transmission routes between said sending apparatus and said receiving apparatus are in a first condition, and said mode selection part selects said second transmission mode when said transmission routes between said sending apparatus and said receiving apparatus are in a second condition which is worse than said first condition.

Claim 44 (Withdrawn): The information transmission system as claimed in claim 40, said radio signal modulation part including a baseband modulation part, and an orthogonal modulation part which orthogonally modulates output of said baseband modulation part.

Claim 45 (Withdrawn): The information transmission system as claimed in claim 44, said radio signal modulation part further including a frequency converter after said orthogonal modulation part, and a local oscillator which generates a reference signal for said frequency converter.

Claim 46 (Withdrawn): The information transmission system as claimed in claim 40, said signal combining part in said receiving apparatus comprising:

- a plurality of orthogonal detection parts which detect baseband signals received by said optical signal receiver;

- a baseband diversity equalization combining part which combines outputs of said orthogonal detection parts; and

- a baseband demodulation part which converts output of said baseband diversity equalization combining part into an original information signal.

Claim 47 (Withdrawn): The information transmission system as claimed in claim 40, said signal combining part in said receiving apparatus comprising:

- a diversity combining part which combines signals of intermediate frequency band or radio frequency band received by said optical receivers;

- a frequency converter for output of said diversity combining part;

- a local oscillator which generates a reference signal for said frequency converter;



an orthogonal detection part which detects baseband radio modulation signals output from said frequency converter;

an equalizer which equalizes and combines output of said orthogonal detection part; and

a baseband demodulation part which converts output of said equalizer into an original information signal.

Claim 48 (Withdrawn): The information transmission system as claimed in claim 40, said signal combining part in said receiving apparatus comprising:

a plurality of frequency converters which perform frequency conversion for signals of intermediate frequency band or radio frequency band received by said optical receivers;

a local oscillator which generates a reference signal for said frequency converters;

a plurality of orthogonal detection parts which detect baseband signals output from said frequency converters;

a baseband diversity equalization combining part which combines outputs of said orthogonal detection parts; and

a baseband demodulation part which converts output of said baseband diversity equalization combining part into an original information signal.

Claim 49 (Withdrawn): The information transmission system as claimed in claim 47, said diversity combining part comprising a part which performs maximum ratio combining for a plurality of input signals.

Claim 50 (Withdrawn): The information transmission system as claimed in claim 47, said diversity combining part comprising a part which performs selection combining for a plurality of input signals according to receive level.

Claim 51 (Withdrawn): The information transmission system as claimed in claim 47, said diversity combining part comprising a part which performs equal gain combining for a plurality of input signals.

Claim 52 (Withdrawn): The information transmission system as claimed in claim 46, said baseband diversity equalization combining part comprising:  
transversal equalizers which equalize input baseband signals; and  
a part for performing maximum ratio combining for outputs of said transversal equalizers.

Claim 53 (Withdrawn): The information transmission system as claimed in claim 46, said baseband diversity equalization combining part comprising:  
transversal equalizers which equalize input baseband signals; and  
a part for performing selection combining for outputs of said transversal equalizers.

Claim 54 (Withdrawn): The information transmission system as claimed in claim 46, said baseband diversity equalization combining part comprising:  
transversal equalizers which equalize input baseband signals; and  
a part for performing equal gain combining for outputs of said transversal equalizers.

Claim 55 (Withdrawn): The information transmission system as claimed in claim 46, said baseband diversity equalization combining part comprising an adaptive decision feedback type transversal combining diversity part.

Claim 56 (Withdrawn): The information transmission system as claimed in claim 55, wherein said adaptive decision feedback type transversal combining diversity part uses an adaptive algorithm for determining tape coefficients of said transversal equalizers.

Claim 57 (Withdrawn): The information transmission system as claimed in claim 46, wherein RLS algorithm is used as said adaptive algorithm.

Claim 58 (Withdrawn): The information transmission system as claimed in claim 56, wherein LMS algorithm is used as said adaptive algorithm.

Claim 59 (Withdrawn): An information transmission method used for transmitting information from a sending apparatus to a receiving apparatus, said information transmission method comprising the steps of:

said sending apparatus modulating an information signal, transmitting said information signal which is modulated to said receiving apparatus via a plurality of routes as a radio signal and an optical signal;

said receiving apparatus receiving said radio signal transmitted from said sending apparatus and outputting a first signal, and receiving said optical signal transmitted from said sending apparatus and outputting a second signal; and

said receiving apparatus combining said first signal and said second signal, and regenerating said information signal.

Claim 60 (Withdrawn): The information transmission method as claimed in claim 59, said information transmission method further comprising the steps of:

said sending apparatus dividing said information signal into a first signal part and a second signal part;

wherein said sending apparatus terminates said first signal part to said receiving apparatus as a radio signal, and transmits said second signal part to said receiving apparatus as an optical signal.

Claim 61 (Currently Amended): An information transmission method used for transmitting information from a sending apparatus to a receiving apparatus, said information transmission method comprising the steps of:

selecting one of a first transmission mode and a second transmission mode,

said sending apparatus ~~dividing an information~~ demultiplexing a data signal into a first data signal ~~part~~ and a second data signal ~~part~~ that are different from each other, modulating said first data signal ~~part~~ and said second data signal ~~part~~;

controlling said sending apparatus such that said first data signal ~~part~~ is transmitted to said receiving apparatus as a radio signal and said second data signal ~~part~~ is transmitted to said receiving apparatus as an optical signal when said first transmission mode is selected;

controlling said sending apparatus such that said information signal is transmitted to said receiving apparatus via a plurality of routes including a radio transmission route and an optical transmission route when said second transmission mode is selected;

said receiving apparatus multiplexing said first data signal ~~part~~ and said second data signal ~~part~~ when said first transmission mode is selected; and

said receiving apparatus diversity-combining said information signal which is transmitted via said plurality of routes when said second transmission mode is selected.

Claim 62 (Original): The information transmission method as claimed in claim 61, wherein said first transmission mode is selected when transmission routes between said sending apparatus and said receiving apparatus are in a first condition, and said second transmission mode is selected when said transmission routes between said sending apparatus and said receiving apparatus are in a second condition which is worse than said first condition.

Claim 63 (Withdrawn): A sending apparatus comprising:  
a radio signal modulation part for modulating an information signal;  
a radio signal transmitter for transmitting said information signal which is modulated as a radio signal; and  
an optical signal transmitter for transmitting said information signal which is modulated as an optical signal.

Claim 64 (Withdrawn): The sending apparatus as claimed in claim 63, said sending apparatus further comprising:  
a signal conversion part for converting said information signal which is modulated to a radio signal of an intermediate frequency band;

a frequency conversion part for converting frequency band of said radio signal to a radio frequency band;

an optical signal conversion part for converting said radio signal of said intermediate frequency band to an optical signal.

Claim 65 (Withdrawn): The sending apparatus as claimed in claim 63, said sending apparatus further comprising:

a digital signal conversion part for converting said information signal to a digital signal;

an analog signal converter for converting said digital signal into a radio signal of an analog signal format; and

an optical signal conversion part for converting said digital signal to an optical signal.

Claim 66 (Withdrawn): The sending apparatus as claimed in claim 63, said sending apparatus further comprising:

a signal dividing part for dividing said information signal into a first signal part and a second signal part;

wherein said radio signal transmitter transmits said first signal part as a radio signal, and said optical signal transmitter transmits said second signal part as an optical signal.

Claim 67 (Currently Amended): A sending apparatus comprising:

a mode selection part ~~for selecting~~ configured to select one of a first transmission mode and a second transmission mode,

a ~~signal dividing part for dividing~~ demultiplexer configured to separate an information signal into a first data signal ~~part~~ and a second data signal ~~part~~ that are different from each other;

radio signal modulation parts ~~for modulating~~ configured to modulate said first data signal ~~part~~ and said second data signal ~~part~~;

a control part ~~for controlling~~ configured to control said sending apparatus such that said first data signal ~~part~~ is transmitted as a radio signal and said second data signal ~~part~~ is transmitted as an optical signal when said first transmission mode is selected;

said control part controlling said sending apparatus such that said information signal is transmitted via a plurality of routes including a radio transmission route and an optical transmission route when said second transmission mode is selected.

Claim 68 (Original): The sending apparatus as claimed in claim 67, wherein said mode selection part selects said first transmission mode when transmission routes between said sending apparatus and a receiving apparatus at the other end are in a first condition, and said mode selection part selects said second transmission mode when said transmission routes are in a second condition which is worse than said first condition.

Claim 69 (Canceled).

Claim 70 (Currently Amended): A receiving apparatus comprising:

a radio signal receiver ~~for receiving~~ configured to receive a radio signal and ~~outputting output~~ a first data signal;

an optical signal receiver ~~for receiving~~ configured to receive an optical signal and ~~outputting output~~ a second data signal; and

a signal combining part ~~for combining~~ configured to combine said first data signal and said second data signal, and ~~regenerating said~~ regenerate an information signal,

said receiving apparatus further comprising:

a mode selection part ~~for selecting~~ configured to select one of a first transmission mode and a second transmission mode;

wherein, when said first transmission mode is selected, said first signal and said second signal are different from each other and are multiplexed into an information signal, and, when said second transmission mode is selected, said first signal and said second signal are the same and are diversity-combined by said signal combining part.

Claim 71 (Original): The receiving apparatus as claimed in claim 70, wherein said mode selection part selects said first transmission mode when transmission routes between said sending apparatus and said receiving apparatus are in a first condition, and said mode selection part selects said second transmission mode when said transmission routes between said sending apparatus and said receiving apparatus are in a second condition which is worse than said first condition.